Emergence of Regional Jets and the Implications on Air Traffic Management

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Background and Motivation

- Airlines are buying regional jets to better better match aircraft size to high value demand markets
- This growth will accelerate as a result of of post 9/11 scope clause renegotiations
- This represents a major change from traditional traffic patterns
- The air traffic management system will have to adapt to these changes

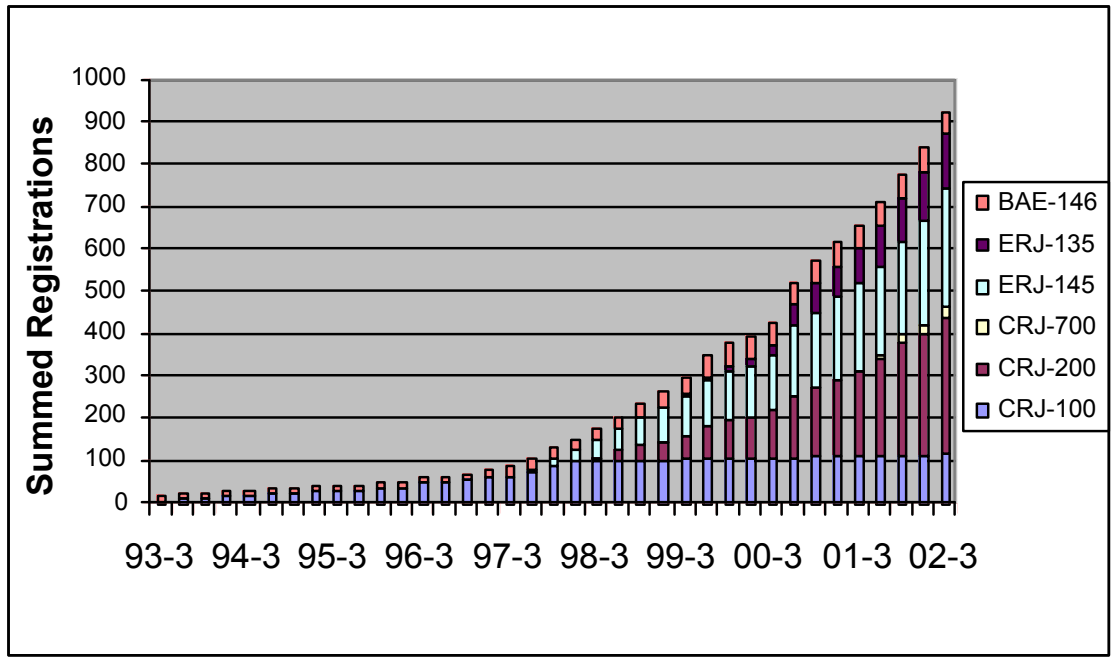
Data

- Source: Aircraft Situational Display to Industry (ASDI); fed from Volpe
- Analyzed data set: all flight data for flights that departed between between midnight November 14th 2002 GMT and and November 15th GMT 2002

Regional Jet Trends

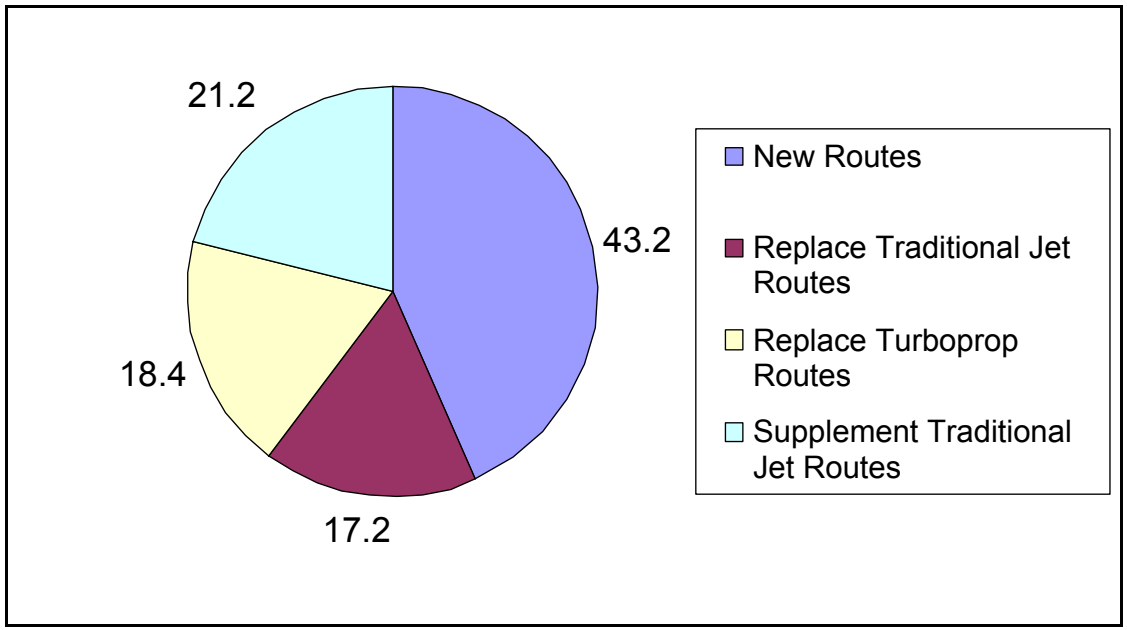
Growth in Regional Jets

- FAA registration data between between 1993 and 2002
- Growth in registered RJs is exponential



Utilization of Regional Jets

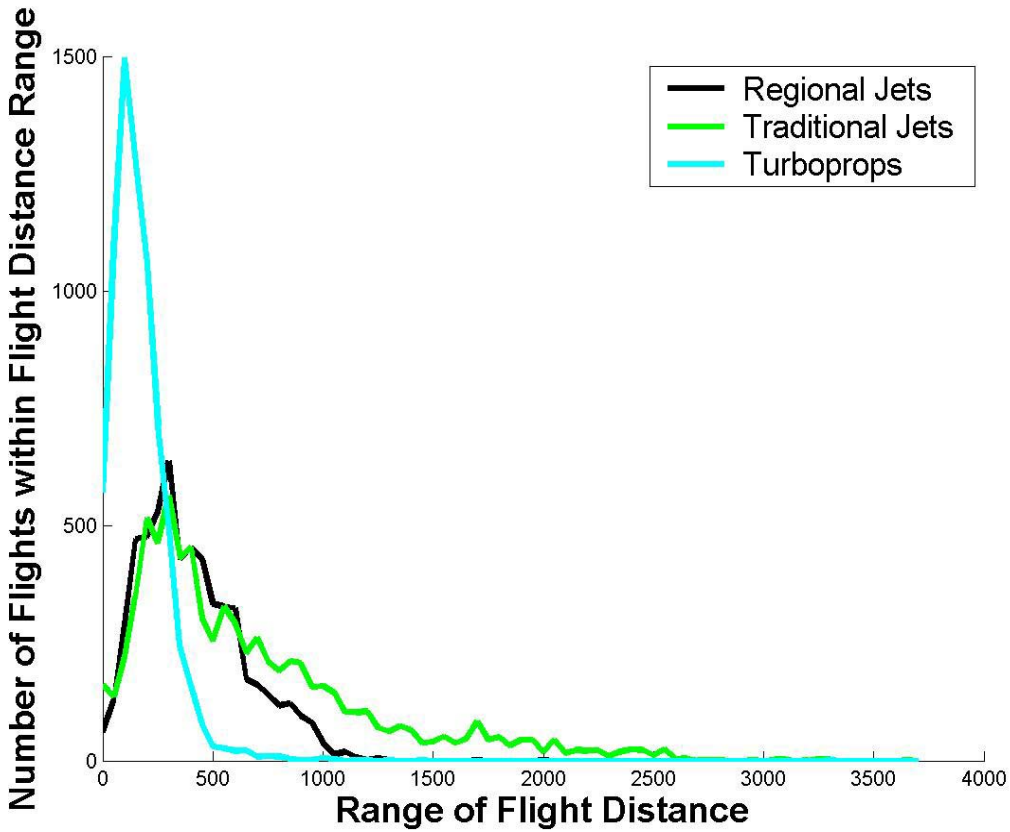
- Comparison between 1992 and 2001
- Shows a change in the the composition and utilization of national fleet



Source: Regional Air Service Initiative

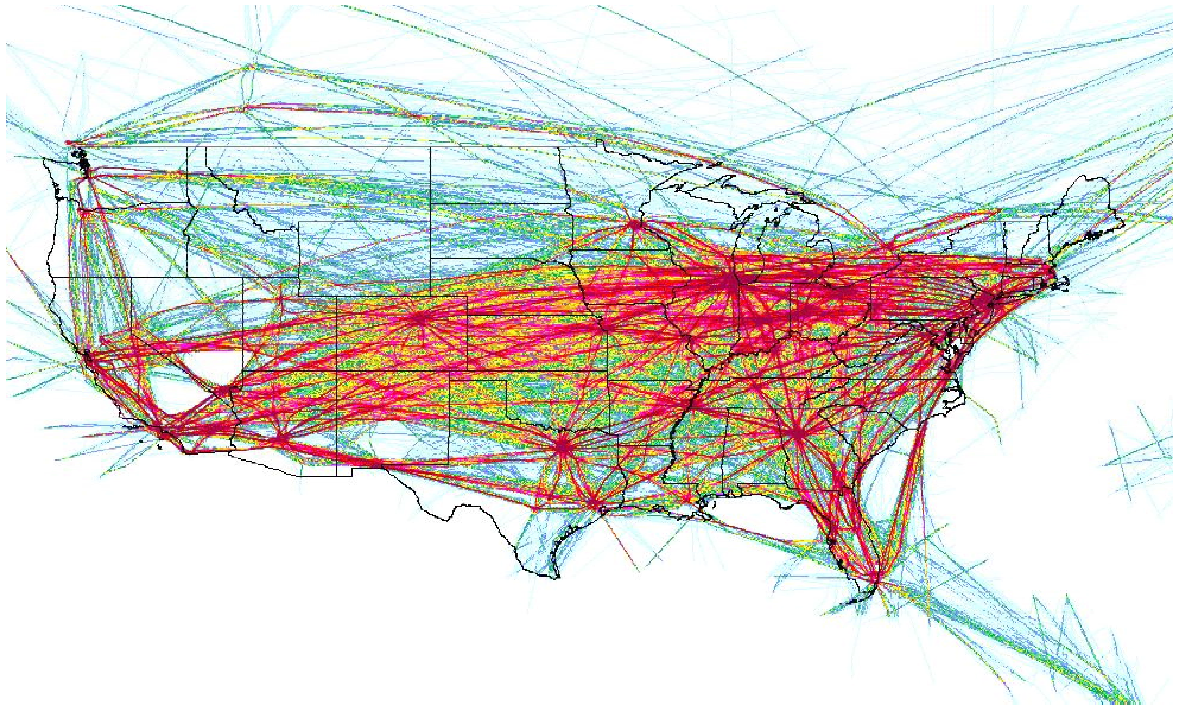
Distance Histogram

- Calculated as great circle distance between first and last update point
- Gap between regional regional and traditional jets is closing
- Average regional distance in 1998 was 375 miles compared to 424 miles here
- Means that regional jets and traditional jets are being used in the same ways



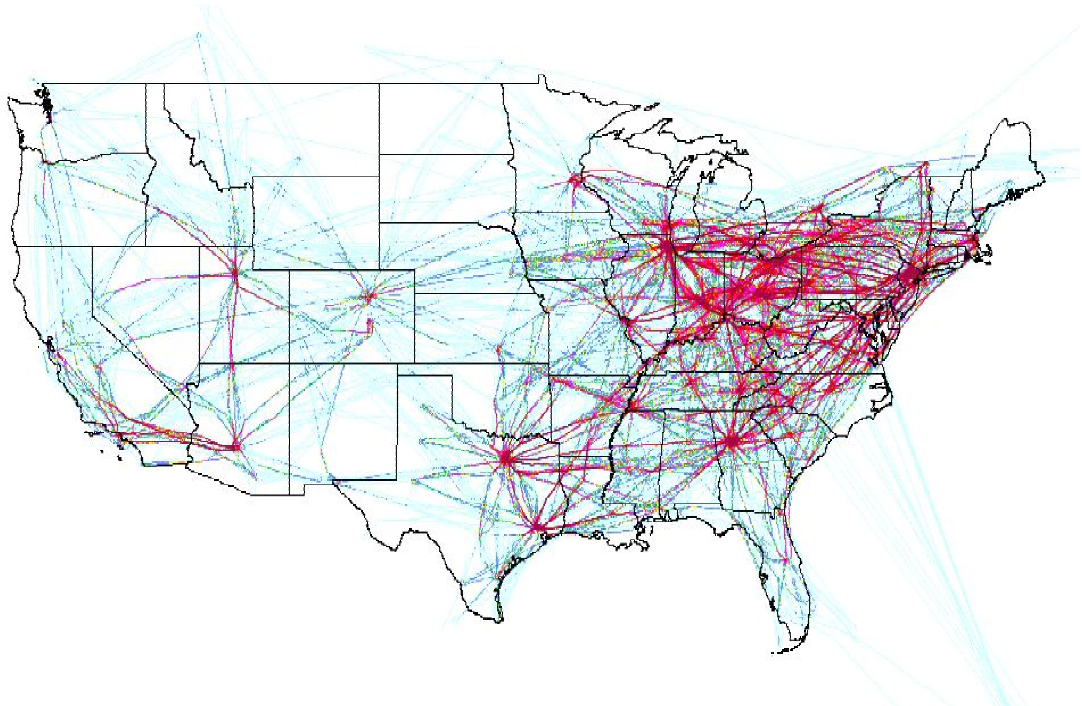
Traditional Jet Density

- Density covers the entire US
  - Light blue 1-2 flights
  - Dark red > 40 flights
- Concentrated at hubs
- Large number of transcontinental flights



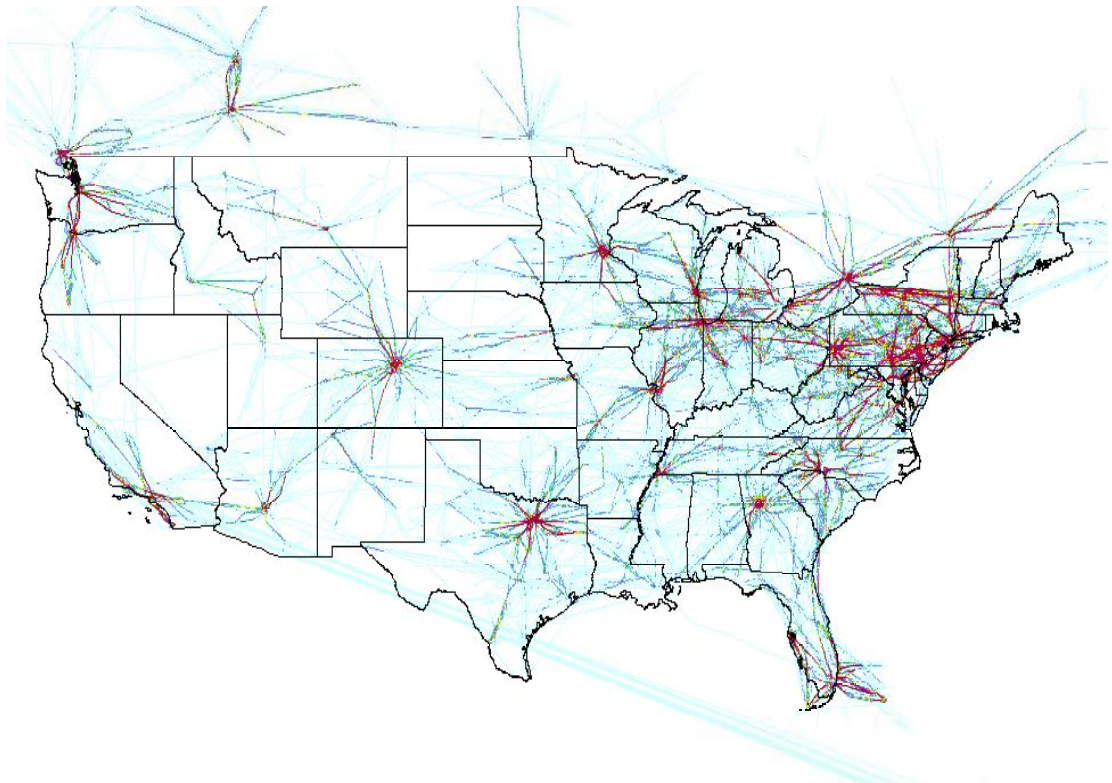
Regional Jet Density

- High concentration of flights in the north north east
  - Light blue 1-2 flights
  - Dark red > 20 flights
- Concentrated at hubs
- Few transcontinental flights



Turboprop Density

- Fewer number of flights compared to to traditional and regional jets
  - Light blue 1-2 flights
  - Dark red > 10 flights
- Concentrated at hubs
- No transcontinental flights
- Few flights connecting hubs

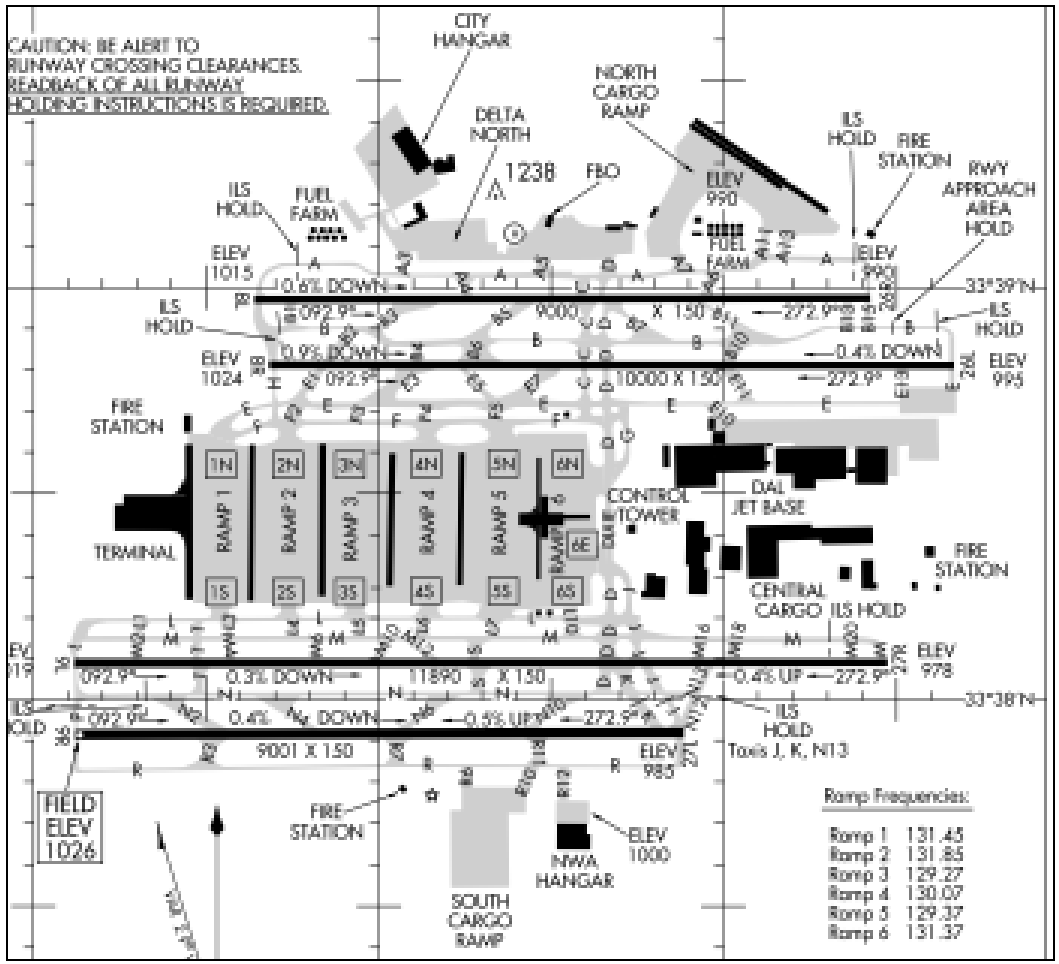


Performance Implications

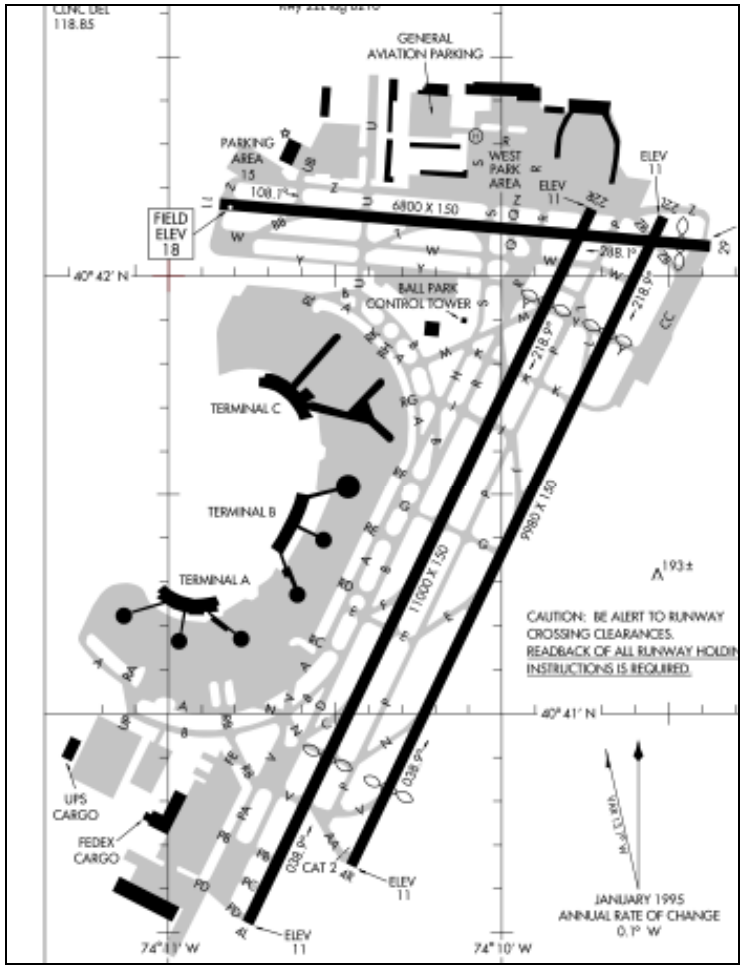
Airport Implications

- Regional jets and traditional jets compete for runway space, while turboprops can use shorter runways
- Regional jets have a longer ground roll than turboprops
- Increase in regional jets means an increase of operations for the same number of passengers

Atlanta Airport Surface Diagram



Newark Airport Surface Diagram

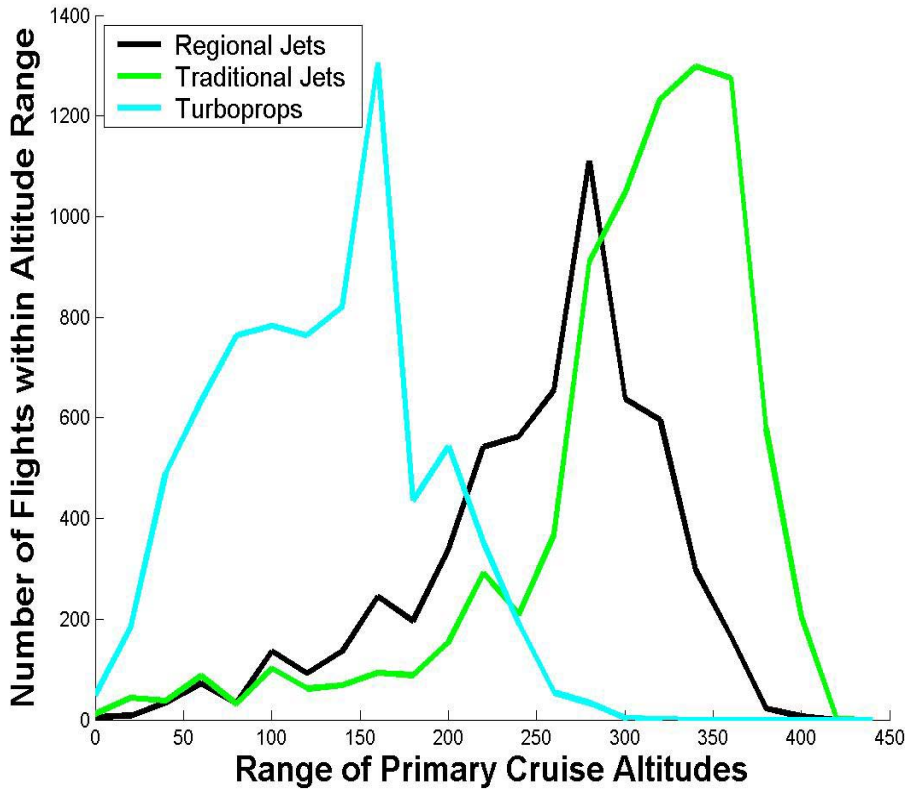


Implications at Cruise

- Regional jets and traditional jets share some high density flight routes
- The two types of jets perform differently differently at cruise

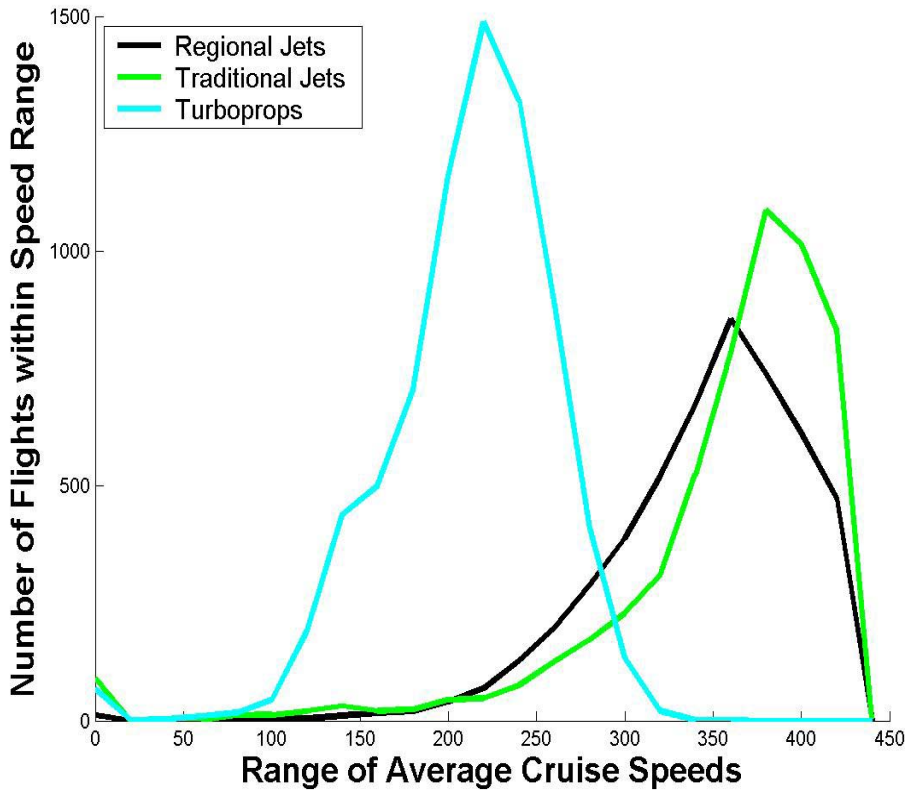
Altitude Histogram

- Turboprops cruise cruise lower than the jets, and have almost no interaction with them at cruise
- High level of interaction between regional jets and traditional traditional jets between 28,000 ft ft and 32,000 ft



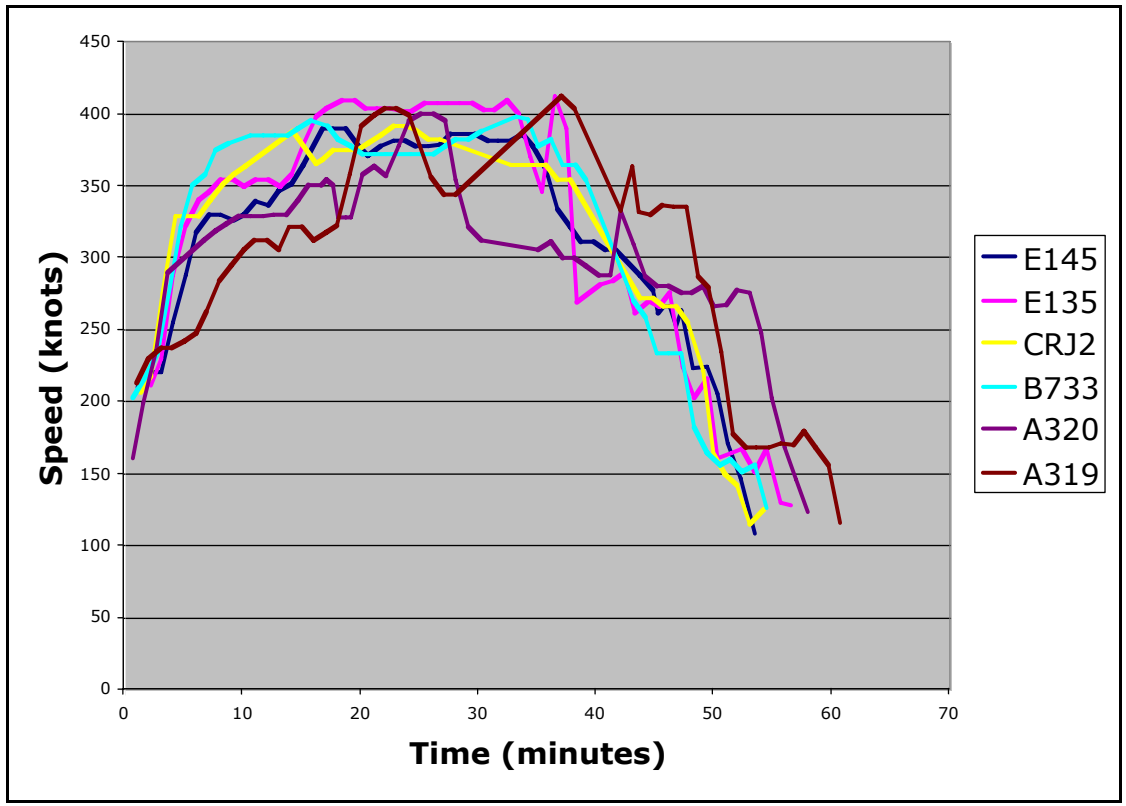
Speed Histogram

- Regional jets have an average cruise cruise speed that is lower than traditional traditional jets



Flights from CLE to ORD

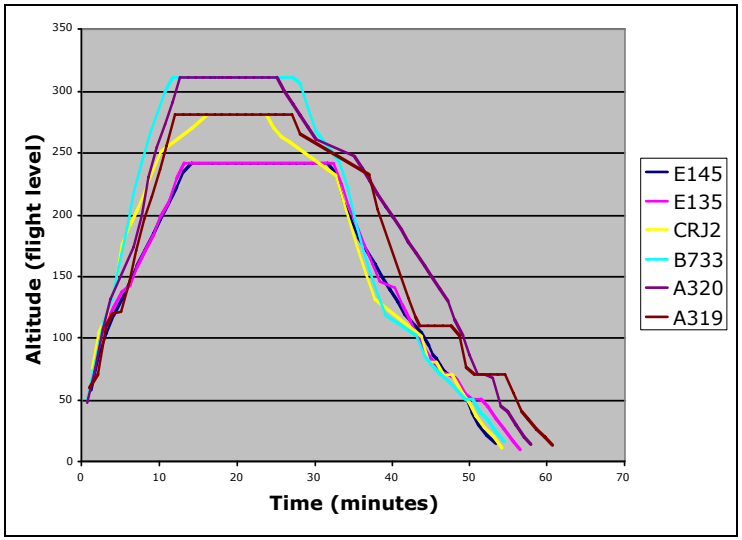
- In a specific example regional regional and traditional jets have about the same speed
- This means that either the traditional jets are slowing down down or the regional jets are forced to fly above optimum cruise speed

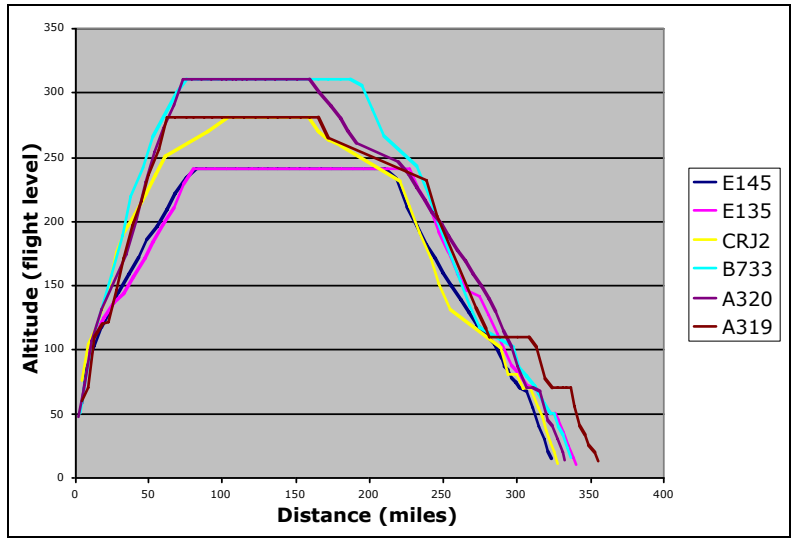


Implications for the Terminal Area

- Regional jets seem to climb slower than than traditional jets, which can pose problems for air traffic controllers

Flights from CLE to ORD

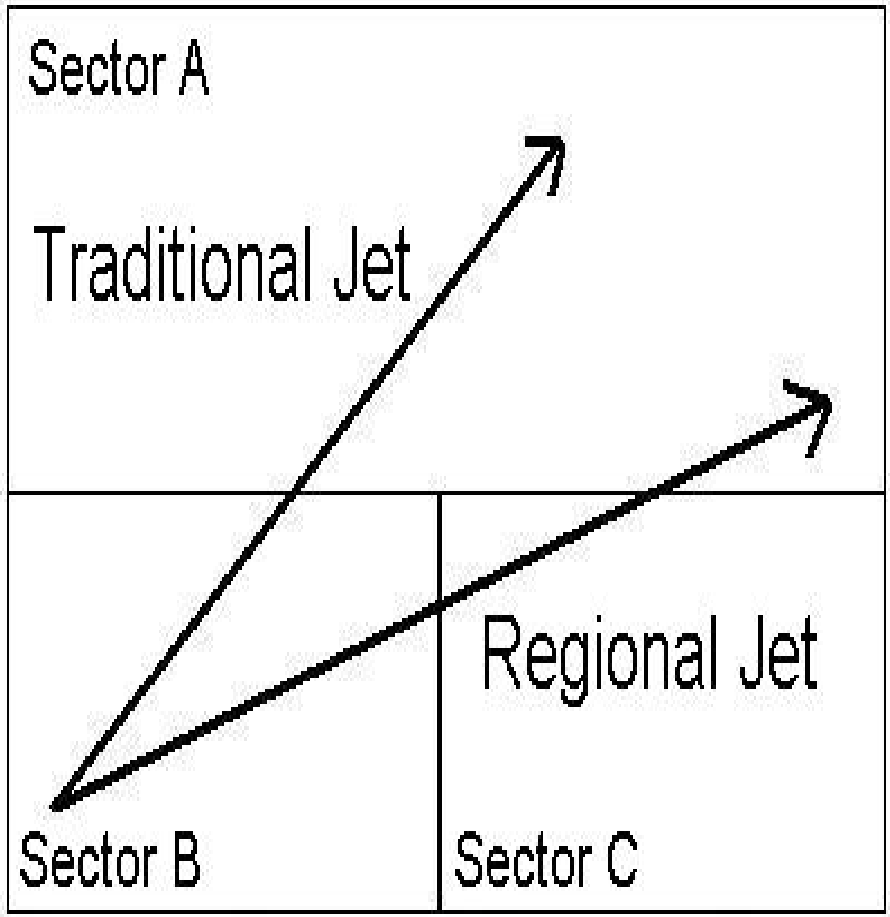




- Climb rate and slope below 10,000 ft are the the same for regional and traditional jets
- Above 10,000 ft ERJs emerge as having a slower climb rate and slope

Implications for Sector Structure

- Sectors currently designed to minimize handoffs
- Slower climb of regional jets may increase the handoffs

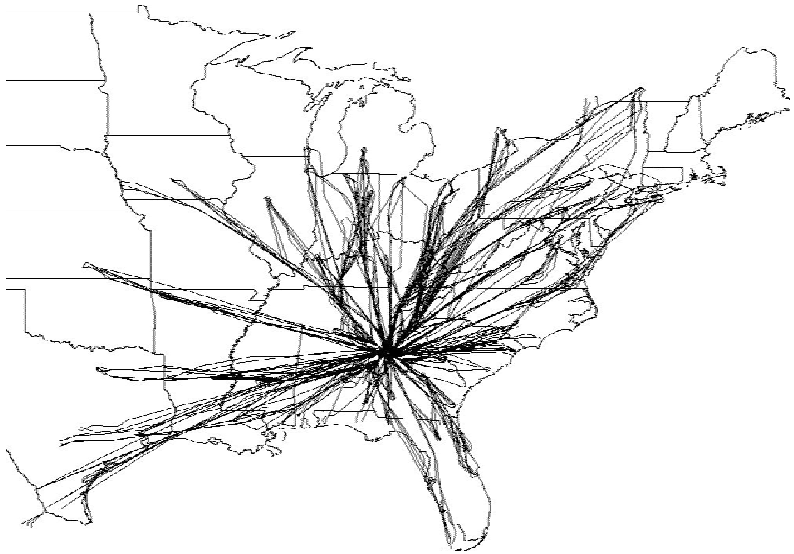


Conclusion

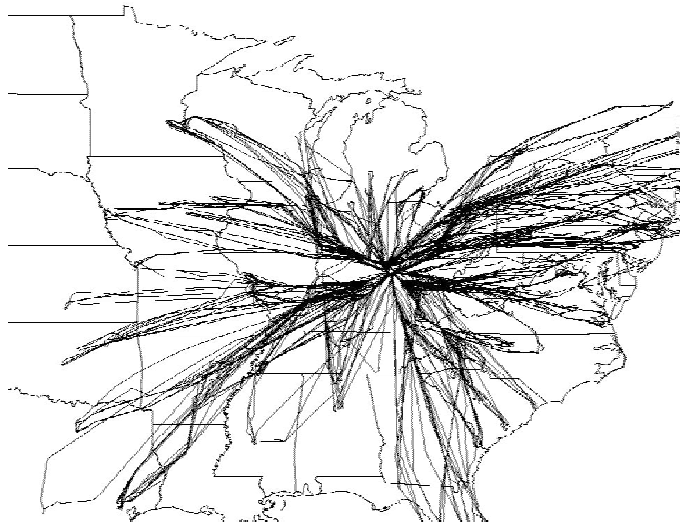
- Regional jets are increasingly common common in high traffic regions
- Performance differences lead to resource contention
- Contention may cause delays and increased complexity for controllers

Questions

Hub Concentration



Atlanta Hub



Cincinnati Hub

- Atlanta is a regional and traditional jet hub
- Cincinnati is a regional jet hub